

WE CLAIM:

1 1. A method for evaluating the corrosion inhibiting activity of a coating, comprising
2 the steps of:

3 providing a cathode comprising an oxygen reduction catalyst;

4 placing the cathode, an anode and the coating in electrical contact with an
5 electrolytic solution;

6 positioning the cathode at a predetermined distance from the coating;

7 causing the electrolytic solution to flow laminarly between the coating and the
8 cathode;

9 applying a voltage between the cathode and the anode such that oxygen in the
10 electrolytic solution is reduced at the cathode and an oxygen reduction current flows
11 through the cathode;

12 measuring the oxygen reduction current flowing through the cathode under
13 reproducible and constant hydrodynamic conditions; and

14 comparing the oxygen reduction current measured in said step of measuring with
15 the oxygen reduction current measured under equivalent conditions but in the absence of
16 substantial effects of corrosion inhibiting species.

1 2. The method of Claim 1, wherein the oxygen reduction catalyst is selected from the
2 group consisting of osmium, ruthenium, iridium, rhodium, platinum, palladium, gold, silver,
3 copper, carbon, and alloys thereof.

1 3. The method of Claim 1, wherein the cathode is a rotating disk electrode and said
2 step of causing the electrolytic solution to flow laminarly between the coating and the cathode
3 includes a step of rotating the cathode at a predetermined constant rate.

1 4. The method of Claim 3, wherein the predetermined constant rate is selected to be
2 in the range from 100 to 10,000 rpm.

1 5. The method of Claim 1, wherein the predetermined distance is less than 1.0 mm.

1 6. The method of Claim 1, wherein said step of causing the electrolytic solution to
2 flow laminarly between the coating and the cathode includes a step of pumping the electrolytic
3 solution.

1 7. The method of Claim 1, further comprising a step of:
2 placing a reference electrode in electrical contact with the electrolytic solution.

1 8. The method of Claim 7, wherein the voltage applied in said step of applying is
2 such that the potential of the cathode relative to the reference electrode is a predetermined
3 potential value.

1 9. The method of Claim 8, wherein the predetermined potential value is selected
2 such that the oxygen reduction current is oxygen diffusion limited.

1 10. A method for evaluating the corrosion inhibiting activity of a coating, comprising
2 the steps of:

3 providing a cathode comprising an oxygen reduction catalyst;

4 placing the cathode, an anode, a reference electrode, and the coating in electrical
5 contact with an electrolytic solution;

6 positioning the cathode at a predetermined distance from the coating;

7 causing the electrolytic solution to flow laminarly between the coating and the
8 cathode;

9 applying a potential to the cathode relative to the reference electrode such that
10 oxygen in the electrolytic solution is reduced at the cathode under oxygen diffusion-
11 limited conditions and an oxygen reduction current flows through the cathode;

12 measuring the oxygen reduction current flowing through the cathode under
13 reproducible and constant hydrodynamic conditions; and

14 comparing the oxygen reduction current measured in said step of measuring with
15 the oxygen reduction current measured under equivalent conditions but in the absence of
16 substantial effects of corrosion inhibiting species.

1 11. A method for evaluating the corrosion inhibiting activity of a coating, comprising
2 the steps of:

3 providing a cathode comprising an oxygen reduction catalyst selected from the
4 group consisting of osmium, ruthenium, iridium, rhodium, platinum, palladium, gold,
5 silver, copper, carbon and alloys thereof;

6 placing the cathode, an anode, a reference electrode, and the coating in electrical
7 contact with an electrolytic solution;

8 positioning the cathode at a predetermined distance of less than 1.0 mm from the
9 coating;

10 causing the electrolytic solution to flow laminarly between the coating and the
11 cathode;

12 applying a potential to the cathode relative to the reference electrode such that
13 oxygen in the electrolytic solution is reduced at the cathode under oxygen diffusion-
14 limited conditions and an oxygen reduction current flows through the cathode;

15 measuring the oxygen reduction current flowing through the cathode under
16 reproducible and constant hydrodynamic conditions; and

17 comparing the oxygen reduction current measured in said step of measuring with
18 the oxygen reduction current measured under equivalent conditions but in the absence of
19 substantial effects of corrosion inhibiting species.

1 12. The method of Claim 11, wherein the cathode is a rotating disk electrode and said
2 step of causing the electrolytic solution to flow laminarly includes a step of rotating the cathode
3 at a predetermined constant rate in the range from 100 to 10,000 rpm.

1 13. The method of Claim 11, wherein said step of causing the electrolytic solution to
2 flow laminarly includes a step of pumping the electrolytic solution.

1 14. An apparatus for evaluating the corrosion inhibiting activity of a coating,
2 comprising:

3 a cathode comprising an oxygen reduction catalyst;

4 an anode;
5 an electrolytic solution;
6 a means for applying a voltage between said cathode and said anode; and
7 a means for causing said electrolytic solution to flow laminarly between the
8 coating and said cathode,
9 wherein said cathode, said anode and the coating are in electrical contact with said
10 electrolytic solution, and said cathode is positioned a predetermined distance of less than 1.0 mm
11 from the coating surface.

1 15. The apparatus of Claim 14, further comprising a reference electrode in electrical
2 contact with said electrolytic solution.

1 16. The apparatus of Claim 15, wherein said means for applying a voltage between
2 said cathode and said anode includes a potentiostat.

1 17. The apparatus of Claim 14, wherein said means for causing said electrolytic
2 solution to flow laminarly between the coating and said cathode includes a liquid pump.

1 18. An apparatus for evaluating the corrosion inhibiting activity of a coating,
2 comprising:
3 a rotating disk cathode comprising an oxygen reduction catalyst;
4 an anode;
5 an electrolytic solution; and
6 a means for applying a voltage between said cathode and said anode,
7 wherein said cathode, said anode and the coating are in electrical contact with said
8 electrolytic solution, and said cathode is positioned a predetermined distance of less than 1.0 mm
9 from the coating surface.

1 19. The apparatus of Claim 18, further comprising a reference electrode in electrical
2 contact with said electrolytic solution.

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1 20. The apparatus of Claim 19, wherein said means for applying a voltage between
2 said cathode and said anode includes a potentiostat.

1 21. An apparatus for evaluating the corrosion inhibiting activity of a coating,
2 comprising:

3 a rotating disk cathode comprising an oxygen reduction catalyst;

4 an anode;

5 a reference electrode;

6 an electrolytic solution; and

7 a potentiostat for applying a potential to said cathode relative to said reference
8 electrode,

9 wherein said cathode, said anode and the coating are in electrical contact with said
10 electrolytic solution, and said cathode is positioned a predetermined distance of less than 1.0 mm
11 from the coating surface.